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ABSTRACT

When social science students try to solve statistics problems, the two major problems that they often face are how to get "the machine" to give them results they want and problem identification. The goal of this project at Michigan State University was to provide a supplementary educational tool for political science classes through the use of World Wide Web-based tutorials and applied social constructivist approach in distance learning. How this approach accommodates and improves student performance was examined. The developers set up the following Web sites: Document Center, Virtual Study Center, Testing Center, Surfing Center, and Teaching Center. Communication between the development team and the professor was an integral part of this project. The main results that the developers hope to achieve are: to fulfill the missing component of what the classroom text does not provide--the generation of problems in mixed order--so that students can learn to distinguish the various types of problems; and to provide a communication tool for social constructivist learning over long distances. (AEF)

A Statistics Class Website: Distance Learning on the Internet

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This research team is composed of two technology education graduate students, who will serve as Web developers, and their client, the professor for Political Science 801 and 802. The main goal of the project is to provide a supplementary educational aid to the client through the use of web-based tutorials and applied social constructivist approach in distance learning. The research examines how this approach accommodates and improves student performance.

The Problem

When social science students try to solve statistics problems, there are two major problems that they often face. The first is "how do I get the machine to give me results that I want." The "machine" is often the computer, but for many it is even their scientific calculators. Many social science students do not like math (as a student once put it: "I went into political science so I could avoid equations"). As a result, they tend to shy away from the subject whenever possible. They have a basic competency in the subject because of high school math requirements, but it often ends there. As a result, they are also not familiar with computational technology. For example, in Political Science 801 at Michigan State University, when presented with an explanation of factorials and told that this can more easily be found using the n! (or x!) button on their calculators, the students' eyes light up because now they finally know what that little button does. Another example would be students' recent revelation of how to find the value e^x (read "e raised to the x power") on their calculators. When this was demonstrated in class, the room was literally abuzz.

Even if they are familiar with computers and calculators, there is another, often more difficult problem for students to overcome as they learn statistics. That difficulty is one of problem identification, although it comes in several forms. Since there are so many different techniques available to use in statistics, students often don't know which to use. This is particularly confusing when the teacher demonstrates that there are often multiple ways of solving a problem - all of which lead to the same answer. Precisely because statistics is as much an art as it is a science, students need practice in recognizing which methods and approaches are most applicable to a particular problem. They also need training in converting a story problem into something they can handle as statisticians.

To do this, they must (a) be able to classify the problem and place it in one of the major categories of statistics problems. After that, they need to (b) be able to decompose the problem so that they can extract all of the relevant information from it. Following that, they would then (c) execute the appropriate method(s) to find the solution. This last stage is often the easiest; it is the first two that cause students the most problems.

Textbooks are often less than helpful in dealing with steps (a) and (b) because exercises are often placed at the end (or within) the chapters which cover the relevant material. The result is the student doing just the textbook problems rarely gets much insight on (a) since it doesn't take a genius to figure out that problems at the end of the binomial distribution chapter probably can be classified as binomial distribution problems. In addition, textbook type problems often give the students exactly the information they need to solve the problem in an easily digestible format, hence hurting their practice on step (b). In contrast, some of the exam problems are more reflective of the real world because there is either irrelevant information included or subtlety in the way the information is presented. What textbook problems are really good at is helping a student with the mechanics (c). Not surprisingly, students often state that once they work a problem past the (a) and (b) point, they can figure it out from there.

Because the issue of problem identification is harder to address using traditional methods and affects a larger percentage of students, it is this problem that needs to be addressed first. The problem of students' unfamiliarity with "machine" usage will naturally be mitigated with time as they use more computer-based learning.

Ideal Solutions to the problem:

1. The ideal would be to have a data bank of 100 plus questions from which the computer randomly draws to create a 10-question test for the student. This primarily

works on improving and diagnosing deficiencies in step (a). Taking this little test would identify a student who is weak in the ability to recognize and classify (and thus solve) certain types of problems and then send that student off to a review section which may be helpful. This wouldn't cover every area in every test, but it would give the student an opportunity to retake the test many times as they try to learn this material. Also, if students were able to see and comment on other student's work on the Internet, they could help each other learn through the process of social constructivist learning.

2. A chat room for group studies would be ideal. Students working together in study groups can learn effectively, but some of our students (particularly MPA students) live quite a distance from Lansing and commute for classes. Commuting for study group time is harder and as a result, these long-distance students either try to get in a group which meets directly after class or skip study groups altogether. Study groups have always been ad hoc, but with a chat room, it could be more structured in terms of time and participation and give more students the opportunity to participate. The professor and the TA have committed to being available in the chat room at certain times, to answer any questions students have.
3. Get old midterm and final exam questions on the web. This is useful, but old copies of exams (and their solutions) have been floating around graduate student circles for quite some time. This information is already available for many students now through unofficial channels. However, not all students, particularly those who have less contact with campus peers, have access to these old exams. The web site would make this access more legitimate and increase the circulation.
4. Place some tutorial information related to the course on the web site. It would be helpful to have expanded information on some of the more difficult statistics concepts taught in class.
5. Post class documents on the site. This site serves mainly as an information center for office hours and course requirements, which the students already have, but may misplace later in the term.

Technology and Limitations

As developers, we found some limitations with using Internet technology, first because the technology itself is in its infancy, and second, because many school computer labs are not yet fully equipped to accommodate what net-based technology can offer. Below are examples that illustrate this point:

1) Ideally, we would like a program that asks a statistics question, then provides a wide, blank space for the students to write out the solutions. Such a program would allow the students to enter the statistical solutions into the answer bank so that others can see their process of solving the problems. However, due to the limitations of html compatibility with math symbols such as pi and lambda, this is not a practical route.

Entering statistics symbols into a website is a function that is still in its infancy in html-based environments. Thus, the best way to enter math symbols such as pi and lambda is by typing it in a word processing program, copying and pasting it into a graphics program and then saving it as a gif or jpeg file. The final step then would be to paste it into the correct designated answer slot into the webpage. This means that all students in Political Science 801 would need to know how to type math symbols, load this text into a graphics program, save it as a file compatible with html, and then load it onto a webpage.

Presently the questions are entered manually in multiple choice form and eWeb provides ready feedback. We are able to type in the feedback to the student by typing symbols out in alpha numeric form, for example, "Your answer is incorrect, the correct answer is c, 2pi X .004; please study Normal Distribution in the teaching center or the text."

2) When Professor Heimann requested a section to show students how to operate certain functions of SPSS, a program his students are using for assignments, the developers wanted to create a video of the professor explaining how to use SPSS and load it onto the website for all students to access. The problem is that even if we use video streaming, and our computers could accommodate a large file, the students use machines that are not compatible with this type of technology, and the students may not know how to download plugins for sound and video.

Actual Solution Outcomes

According to the proposed solutions above, the developers set up the following sites:

- *Document center*: This webpage contains a syllabus with class office hours, course requirements and meeting times.
- *Virtual Study Center*: This center is composed of eWeb, a virtual learning center. Multiple-choice textbook exercises are entered into the Testing/Exercises function of eWeb. Students can use the Forum and the Chat Room in this site to conduct on-line discussion about questions and problems that occurred in class or in the textbook exercises. The purpose of this site is to foster social constructivist learning by using communication technologies over the Internet. Our theory is that as students use the social interactive components of eWeb, such as the Forum and the Chat Room, their prior knowledge will change through the process of challenge and negotiation.

- *Testing Center*: This center stores old exams, class-assigned problem sets, and solutions to textbook exercises posted in the eWeb. The main purpose of this center is to equalize the distribution of old exams that are usually passed from friend to friend in inner circles. Students who are not a part of such a circulation can now access the old exams through this site.
- *Surfing Center*: contains WWW information and links related to statistics so students can expand their understanding from various cyber resources.
- *Teaching Center*: contains demonstrations and explanations about statistics concepts and related topics with color and explicit graphics and diagrams.

Process of Setting up the Project

First, the developers explained the Internet's utilities and developer's capabilities. The developers stated that their ability included setting up interactive web technologies. It was stressed that this website should not be set up for the sake of show and tell, but had to serve a specific need, a need that only the Internet could fulfill.

There were numerous conversations between the client and the developers during the development of the web site for this class, most of them over e-mail. The developers asked the professor (client) what the existing problems were for this course; and what the client expected to achieve through applying technology in his class.

Dr. Heimann clearly stated that he wanted to use this technology as a supplementary tool to his class, and not the main teaching tool. With all the information that the developers collected from the client, they informed the professor what educational technology could do to help him improve his teaching, while constantly assessing the methods that should be used to meet his needs. Fortunately, Dr. Heimann was familiar with Internet technology, making the planning stage very accommodating.

Reflections of the Developers

Working as a team of developers, we noticed that good communication is a necessary dimension of working with computer based technology. Technology tends to change the way we work. We cannot work on projects by ourselves; we have to depend on other's expertise and reliability. Thus, one's success does not merely depend on making a machine work, but also on how one engineers human interrelationships while doing so. During our project, the latter component was more unpredictable than the former.

Working with our client was easier than expected, but still a long process. The death of a member of Dr. Heimann's family was an unpredictable occurrence that discontinued the newly established communication rapport. As Dr. Heimann stopped answering our e-mail, we began to assume the scheduling of our project: Should the Problem Sets go in now, or at the end? We assumed at the end since each Problem Set was dated. We were wrong.

In fact, what we found was that communication between the client and the developer was such an integral part of this project that our every question had to be posed to and answered by Dr. Heimann. Coordinating the times that tests were to be entered was critical in helping students use the Website. Had we assumed that students would know the answers to the textbook questions before the last month of the term, the textbook questions would have been entered much earlier.

Moreover, when we set up a page and told Dr. Heimann, he did not respond right away by telling his students. It was as though we had to prove our work and ourselves before he would announce it to the class. Dr. Heimann's enthusiasm did not peak until we showed the product, in person, and explained the various webpages' functions.

At other times, Dr. Heimann would tell his students, but the students would not respond right away by going to the Website. This slow acculturation to new technology was perhaps due to three reasons: 1) They were unfamiliar with how the Website worked—although we offered to set up a tutorial session—and did not want to try to figure it out because they were already dealing with something new: statistics. Perhaps the researchers were right (Marchionini & Liebscher, 1991) when they found that people "have a tendency to try to lighten their cognitive load as much as possible." Not until the finals neared, and Dr. Heimann encouraged them to take the textbook exercises, did the students begin to do so. 2) A few students did try the site and got confused by going into the Testing page and finding a link to a Purdue testing package (this was an error caused by miscommunication between the members of the team of developers). Once betrayed by technology, people are reluctant try it again. It was interesting to observe that at times even we, as developers tended to put something off if it did not work for us right away. Similarly, Dr. Heimann would not tell us something was not working, unless we asked him how things were going. Perhaps he did this not to embarrass us, or perhaps he, too, put things off if they were not working. 3) The nature of the Internet allows for unaccountability. The students are not required to go to the website and there's very little the professor can do to enforce this. The website is not like a piece of paper that has to be handed in. A prime example of this is the survey we put on the website. We decided that if we passed out the survey on paper during class time, students would be made to do it on the spot. In contrast, the survey on the website may remain untouched, since it is an anonymous survey.

Research component

As a part of this research, we will evaluate the effectiveness, acceptability and affordability of the website as a study aid for Political Science 801 and 802. In evaluating the effectiveness, we will compare the data of student performance from the last five years —in which no such study aid existed, to this year's data—in which students used the website for two terms. To assess acceptability, we will survey the students as to how much they used the website and how much the website helped them. We will also ask for student's opinion of what can be changed or added to facilitate their needs better. We will determine whether their comfort levels with "machines" have risen as a result. To evaluate affordability, we will compare this study aid with another similar type of study aid, the CD-ROM.

What we expect to find

Thus far the professor feels very confident that the student's performance will improve as a result of using the website. He notes the following:

> "I have my teaching assistant and myself log on to the chat room at designated times four times a week. This is great for students who live far away and can't come to office hours. Also, if another student asks me a similar or the same question as was discussed on the eWeb, I can tell them to go back and check out the transcript dialogue files in the chat room."

This is an example of technology adaptation that is purely utilitarian in nature. The class passes through three stages. Both the students and the professor first try to figure out the mechanics of using the website. Then they begin to adapt to the technology to suit their needs. Lastly, they begin looking for other ways to utilize this given technology. We expect Dr. Heimann to adapt other functions of the website to better suit his teaching needs as he realizes more of its potential. For example, the testing and exercises site will eventually coincide with actual class lectures. Presently, there is little coordination in this area.

We also expect the students to become more comfortable using this type of technology and thus the computer. The result will be circular. The more they use the site, the more they will become familiar with how the site can help them, and thus the more they will use the Website. We expect student motivation to rise as they become more familiar with the site.

The difficulty students have in identifying and distinguishing various types of statistics problems should be mitigated as students began to use the testing site more. We expect the final data to show that student performance this year has improved in comparison to the past five years.

Conclusions

Social science students are often bewildered in the area of statistics; they are exploring an unfamiliar realm when it comes to technology and math. We hope to mitigate their fears of both areas by setting up a study aid on the Internet. The main result we hope to achieve is twofold: 1) to fulfill the missing component of what the classroom text does not provide—the generation of problems in mixed order, so that students can learn to distinguish from the various types of problems and 2) provide a communication tool for social constructivist learning over long distances. The study will be ongoing for the duration of Political Science 801, and 802, 1997-98.

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Reference

Marchionini, G. & Liebscher, P. (1991). Performance in electronic encyclopedias: Implications for adaptive systems. *Proceedings of the ASIS Annual Meeting*, 28, 39-48.

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